The fundamental model of disease transmission: the SIR model

We can’t solve these equations by hand, so we use computer simulations:

$$S \xrightarrow{\beta I} I \xrightarrow{\gamma} R$$

How many people do we expect an infectious person to infect?

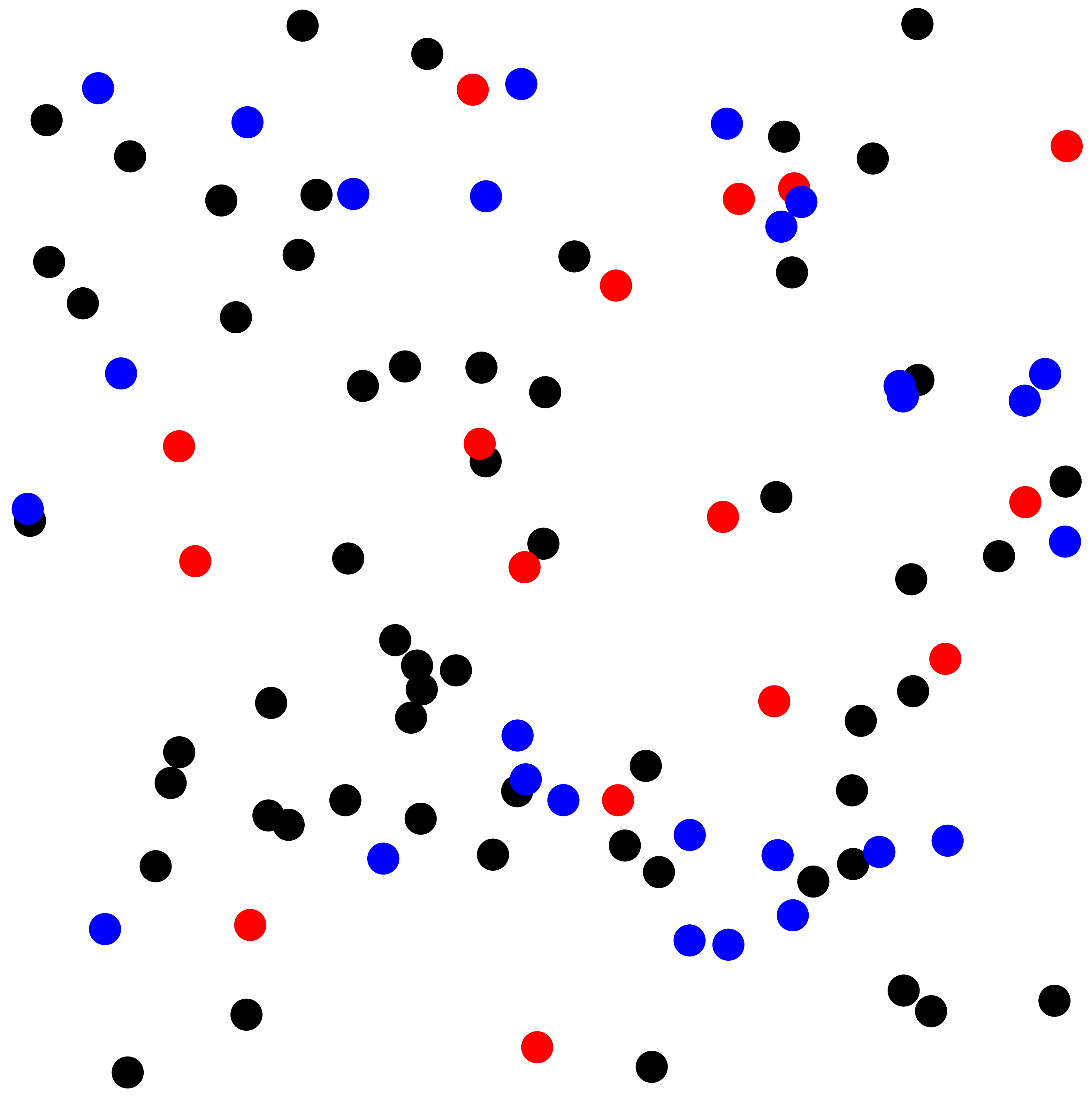
They’ll infect β people per unit of time, until they recover – which happens at rate γ.

So, over the entire course of their infection, we expect them to infect β/γ people.

This is the **basic reproduction number (R_0):** the expected number of people that an infectious person will infect in a totally susceptible population.

Let’s imagine a disease where a person infects one person per week (β = 1) and it takes two weeks to recover (γ = 1/2).

The reproduction number is then
$R_0 = \beta/\gamma = 1/(1/2) = 2$



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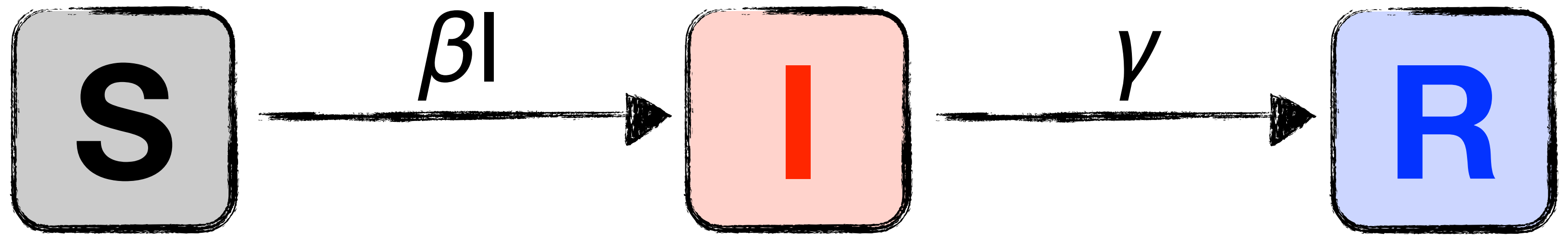

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